Adaptation Policy and Procedures in Central & Eastern Europe

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Executive Summary

As European governments continue to advance their efforts towards mitigating the causes of climate change through emission abatement, there is a clearer understanding that these efforts will not be enough to avoid the expected impacts of a changing climate. Drought, water scarcity and flooding are already a reality for many countries and regions; concerns of sea level rise are mounting; and heat waves are occurring with greater frequency. In light of this it is increasingly being recognized that adaptive measures must be taken. This report looks at the "state of play" of adaptation in the new EU Member States of Central and Eastern Europe (Czech Republic, Estonia, Hungary, Latvia, Lithuania Poland Slovakia and Slovenia). It explores what we see as the three key dimensions of adaptation:

- The institutional setup of adaptation. Which actors and institutions are involved in adaptation planning and execution and what are the priorities of adaptation?
- The policy arena of adaptation. What policies are in place and what policies are planned?
- The procedure of adaptation. What are the constraints and enablers to implementing adaptation?

Based upon a series of interviews with country experts, this report finds that many of the new Member States are in the initial stages of incorporating adaptation into their national climate change programs. The concept and implementation of adaptation is relatively new. This is evidenced by a number of interrelated factors. Adaptation at present is self described as being a low priority or a priority but in initial phase for most of the central governments. Adaptation is often not given a clear distinction between climate change mitigation efforts and activities. While some countries are working towards a national adaptation strategy, only one country (Hungary) has created one. Moreover not every country is committed to pursuing a strategy.

Institutionally, adaptation policy is largely the domain of the Ministries of Environment with input from Ministries of Agriculture. With the exception of Latvia, there are no established inter-ministerial working groups and cooperation across key ministries is largely absent. While there appears to be cooperation between different levels of government (national and regional/local) on issues of disaster risk reduction and risk management, this often falls outside the setting of long-term adaptation to climate change related risks and impacts. Also, according to national level policymakers, lower levels of government do not appear to be cognizant of climate change adaptation,

Adaptation's novelty is also reflected in the small number of policy actions (as compared to various EU-15 MSs and the narrow diversity of domains/sectors they cover (Massey & Bergsma 2008). This in part is related to the factors listed above and also connected to what and how climate change impact knowledge is generated and communicated. The majority of climate research falls under the domains/sectors of agriculture, water management and land management. While not trying to diminish the importance of these domains, especially issues of water quantity and quality, much of the research in these domains (predominantly agriculture) appears to be driven by intellectual and institutional lock-in. Because of the nascent institutional structure supporting adaptation, combined

with cultural preferences, research and/or studies in other domains appears to be shortcoming. An added point is the relation between science and policy. Many of the countries acknowledge the difficulty in translating research results and existing knowledge into policy actions.

In spite of adaptation's novelty, the countries are aware of that there is more work to be done and are optimistic that the existing constraints to effecting adaptation will be addressed in the future. In particular they have been looking towards the European Union for guidance and support. The EU is seen as having significant influence, on the issue of adaptation. In all of the country interviews it was stated that the country was very much looking forward to the release of the adaptation White Paper so as to offer guidance on actions and/or provide political impetus to the central government to address the adaptation. Now that the White Paper has been released we may see adaptation maturing into a distinct policy domain with robust institutions and procedures to support it.

1. Introduction and background

1.1 Introduction

As European governments continue to advance their efforts towards mitigating the causes of climate change through emission abatement, there is a clearer understanding that these efforts will not be enough to avoid the expected impacts of a changing climate. Drought, water scarcity and flooding are already a reality for many countries and regions; concerns of sea level rise are mounting; and heat waves are occurring with greater frequency. In light of this it is increasingly being recognized that adaptive measures must be taken and in fact many countries have already began to develop and implement adaptation plans and strategies. Nevertheless there are numerous challenges and uncertainties surrounding what actions to take, when to take them, and how to implement them. Countries often face similar but different risks from climate change and must work within their own institutional capacity to effect adaptation. There is however also a need to highlight and share information on the impediments as well as good practices emerging at the country and regional level.

This report represents the third phase of research carried out under the auspices of the Netherlands Environmental Assessment Agency (PBL) in an effort to understand the "state of play" of ongoing adaptation efforts in Europe. Phase 1 of the research project sought to create a tool to organize, categorize and compare adaptation policies and activities. This resulted in a so-called "adaptation policy framework" (see Massey 2007). Specifically, the framework offered a means to systematically asses the current level of adaptation policy in a country, the aims of adaptation activities in terms of the motivation behind their actions, and the objectives of adaptation – the domains and sectors of most concern. Phase 2 of the research project applied the framework to data from 29 European countries offering a composite, aggregated and detailed view of these countries activities (see Massey & Bergsma 2008). While Phase 2 helped broaden the understanding of where countries stood in terms of their adaptation activities and revealed many similarities among their concerns for climate impacts, it was not without its shortcomings. Firstly, it relied primarily on openly available data sources (in English) such as UNFCCC National Communications and other national reports. Secondly, as the information analyzed was published prior to the 2007 EU Green Paper on Adaptation (COM (2007) 354, final) the information could be considered slightly outdated. Thirdly, it focused primarily on the number of policy activities with only a cursory look at the content. It did not take into account the institutional aspects, procedures or constraints effecting adaptation.

In order to fill the gaps of the second phase and contribute to the goal of sharing information on adaptation practices, this third phase of the project attempts to go deeper into understanding what countries are doing and the constraints they are confronted with. Via face-to-face interviews, this phase attempts to capture information on what we see as three key dimensions of adaptation. The first dimension relates to the institutional setup to facilitate adaptation activities: Which actors and institutions are involved in adaptation planning and execution. The second dimension looks at the policy arena

of adaptation: What policies are in place and what policies are planned. The third dimension questions the procedure of adaptation, asking questions related to the identification of climate risks, the use of scenarios in the creation of adaption activities and the constraints to implementing adaptation measures. Given that 15 people were interviewed in total, the results of this phase may not represent the totality of actions and opinions in and for each Member State.

1.2 Survey, country selection and methodology

1.2.1 Survey

As stated above, Phase 3 began with the creation of a survey that has been conducted via face-to-face interviews and over the telephone. The survey is divided into three main sections and six sub-sections (see Appendix I for survey example).

- The first main section covers institutional aspects, asking specific questions on the priority of adaptation, the institutional set up to support adaptation, cooperation between different levels of government, and the generation of knowledge that underpins adaptation policy activities.
- The second main section on policy -tailored to a specific country being interviewed- presents the adaptation policy activities identified for that country in Phase 2 and asks questions related to the accuracy of the information and the development of new activities.
- The third main section of the survey (Procedures and Constraints) presents the identified domains and aims of adaption(from Phase 2) for a particular country seeking to understand if they are representative of the country, how they came to be identified, and what the overall constraints are in effecting adaptation. All in all the survey has 23 questions.

1.2.2 Country selection

While Phase 2 of the research looked at 29 European countries, Phase 3 had to be limited to select number of countries due to the length of the survey, the mode in which it was to be conducted, and materiel resources available for the project. It was decided that eight Member States from Central and Eastern Europe should be investigated: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. The logic behind this choice was threefold. First, previous research determined that this bloc of countries was in a nascent stage of adaptation as compared to Western Europe. Whereas Western Europe showed a policy level breakdown among adaptation activities of 38% Policy Measures, 27% Policy Recommendations and 35% Policy Concerns, Central and Eastern Europe on average revealed 4% Policy Measures, 44% Policy Recommendations and 52% Policy Concerns (Massey and Bergsma 2008) (see Section 3 for detailed definition of terms).

Figure 1.1 Map of country selection.

Given this gap in the adaptation levels, especially between the percentage of implemented policy measures, it was felt further study might help reveal the issues and constraints these new Member States were facing. Second, the previous phase also revealed that most of these countries shared the same limited number of adaptation aims, focusing primarily on food security (agriculture), water management issues and land management. This was quite different to the diversity of aims between other countries in Western Europe (see Massey Bergsma 2008). Third, as the EU integrated project Adaptation and Mitigation Strategies: Supporting European Climate Change Policy (ADAM) showed, very little research had been conducted in these new Member States in the context of European climate change impacts, vulnerability and adaptation (Hoffmann & Hinkel forthcoming). The combination of these factors and the fact that the Partnership for

European Environmental Research (PEER) was conducting survey of primarily EU-15 countries, thus made for an interesting case study.

Table 1.1 Socio-economic data of selected countries (Sources: UNDP 2007, CIA World Factbook 2009).

	Pop. in millions (2005)	GDP per capita (PPP US$)	Total land area in (km2 thou-sands)	% For-est area to land	Coastline (km)(incl. islands)	Agriculture % of GDP	% of work-force in agricul-ture
Czech Republic	10.2	26,800	77.2	34.3	landlocked	2.6	3.6
Estonia	1.3	21,900	43.2	53.9	3,794	2.9	4.7
Hungary	9.9	20,500	92.3	21.5	landlocked	3.2	5
Latvia	2.2	17,800	63.5	47.4	498	3.3	12.1
Lithuania	3.5	18,400	65.3	33.5	90	4.3	14
Poland	38.4	17,800	304.4	30	440	4	17.4
Slovakia	5.4	22,600	48.8	40.1	landlocked	2.6	4
Slovenia	2	30,800	20.1	62.8	46.6	2.2	2.5

1.2.3 Methodology

Apart from standardized questions, each survey was tailored to fit one particular country by presenting data and findings on that country from the previous work. The surveys were designed to be conducted via face-to-face interviews, supplemented by telephone calls. Interview length ranged between 60-90 minutes. This approach was chosen as it provided for a robust and exhaustive discussion on the questions. Using the Interest Group on Climate Change Adaptation within the network of European Environmental Protection Agencies as a resource base, interviewees were identified in ministries, government agencies, universities and research institutes. All but one country, Lithuania, responded directly to the survey, though they did provide background information for the work. In total, 15 people were interviewed between November 2008 and April 2009.[1] The survey results were analyzed primarily qualitatively. Also given the limited number of people interviewed, despite their respective positions in each country, the results and conclusions presented in this report may not represent the totality of actions and opinions in and for each Member State.

1.3 Structure of this report

By and large this report is structured around the outline of the survey and presents the results accordingly. The next section (Section 2) looks at the institutional aspects of adaptation and presents a collective overview of the sample countries. Section 3 delves into the issue of adaptation policy actions to see what has changed since the previous phase

[1] It should be noted that on first approach many people declined to be interviewed stating either that they did not have much knowledge on the topic or that their country had little information to share at the moment. Thus the interview period lasted a few months longer than was initially anticipated.

of research. Section 4 presents the findings on the procedural aspects of adaption in terms of the adaptation aims, domains, and constrains covered in the countries. Each section concludes with a discussion on the findings which attempts to synthesize the relevant information within the broader context of carrying out adaptation activities. The report concludes with a general discussion on all the findings offering up points of consideration for both the EU Commission and Member States.

2. Priorities, institutions, cooperation and knowledge generation

The European Commission's 2007 Green Paper on Adaptation (COM (2007) 354, final) stresses that under the current conditions no European region will be spared from the impacts of a changing climate. While the 2009 White Paper (COM (2009) 147, final) states that the severity of impacts will vary across Europe, each country must begin to develop a systematic and organized response to adapt to the impacts, spare excessive future costs and increase the resilience of socio-economic and ecological systems. Interpreting these Papers, a key first step to doing this is through the creation of strategies that 1) systematically assess climate risks, vulnerabilities as well as (in some cases) opportunities, and 2) feeding these assessments into the policy cycle for the development of appropriate policy responses. However, prior to any strategy being undertaken, there needs to be an awareness of the issue and the political will to pursue such a course. The topic of adaptation must first and foremost be a priority for the government.

2.1 Priority of climate change adaptation

The first question of the survey asked respondents to gauge the level of priority towards climate change adaptation in their country. All but one country, Poland, responded that adaptation was a priority, "but in an initial phase". Poland stated that adaption had little to no priority for the national government. Estonia stated that in 2008 there was a short, two-page memorandum from the government saying adaptation would be a concern for the future. For Hungary, while attention to the overall issue was in the initial phase, certain sectors such as agriculture, health and public security were of high priority. Slovenia stated that they were in the very nascent stage in developing an approach to the issue and were waiting for the release of the White Paper for further guidance on how to direct their efforts. The Czech Republic mentioned that they were awaiting the outcomes of various research programs examining expected climate impacts before committing the government to any particular course. Slovakia, like Hungary said their overall priorities were striated with issues such as emergency management for natural disasters receiving a high level of government attention. Latvia and Lithuania, similar to the Czech Republic all spoke to the existence of [government initiated/financed] scientific research programs as evidence of the growing political priority towards adaptation.

Table 2.1 Priority of adaptation as a national government issue (green box indicates priority level).

	Not a priority	Low Priority	Priority, but initial phase	High priority
Czech Republic				
Estonia				
Hungary				
Latvia				
Lithuania				
Poland				
Slovakia				
Slovenia				

2.2 Existence of a national adaptation strategy (NAS)

This initial level of priority among the countries is reflected the absence of any national adaptation strategies, apart from Hungary. In 2008 the Hungarian Government approved a NAS which covers the period 2008-2025 and addresses a cross section of socio-economic sectors and multiple climate impacts. At present the government is working on how best to implement the strategy. As to the remainder of the sample, all countries except Lithuania reported that they were working towards a strategy, although in very different stages and approaches. The level of present effort and to some degree, enthusiasm for the creation and need of a strategy was highly varied. In Estonia, there is an action point on the inter-ministerial agenda that a NAS be developed, however due to the current financial crisis talks on the issue have been suspended and it is uncertain [if and] when work would begin. In Slovenia, the Ministry of Environment has just begun to assemble a team of people from across government ministries and NGO's to begin the process of developing a NAS. Due however to a recent change in the government as well as the financial crisis there is no fixed timetable or schedule of work. Slovenia also reiterated their expectation of the EU White Paper to offer guidance for the creation of their NAS. In 2004, the Czech Republic created a national mitigation plan. This plan, while updated in 2007 is expected to be further updated in mid 2009 to become a general climate protection policy plan and include an adaptation strategy component. As with the Slovenes, the Czechs mentioned that they were very much looking forward to the White Paper not only to offer direction but also to supply political emphasis to the issue. The Polish government has taken a slightly different tack in that the Ministry of Environment in 2009-2010 wishes to create separate strategies for all the important socio-economic sectors. Such strategies will require the approval and be implemented by all relevant ministries. At present, the level of detail for the plans is undecided and also it is uncertain if the Ministry of Environment will garner enough political support among its counterparts to implement this action. Slovakia has stated that that their Hydro-meteorological Institute wishes in mid-2009to carry out a comprehensive sectoral survey on potential responses to future climatic conditions. This work would be fed to the Ministry of Environment and potentially lead to further policy development. There was however, no mention of creating a NAS. The Latvian government has created a report on adaptation to climate change whereby by the end of 2009 they plan to elaborate concrete

policy interventions. As for Lithuania, no mention was made for future developments of a NAS.

Despite the absence of NASs a few countries have elaborated sectoral strategies for addressing the impacts of climate change (Poland, Slovenia, Slovakia) primarily in the field of agriculture, water resources management and forestry. In 2008, Slovenia drafted an agricultural adaptation strategy detailing technical responses to incidents of drought and extreme events. Slovakia has done something similar for their water sector and Poland has a strategy for dealing with drought and soil erosion in their agriculture and forestry domains. Polish also mentioned that their water management strategy contained "elements of adaptation" however this point was not further expanded upon.

2.3 Potential development of adaptation actions: mainstreaming vs. new policies

In the development of adaptation actions the European Commission iterated in both the Green Paper and White Paper that adaptation should be mainstreamed into existing policies and measures. In light of this, the survey queried what the primary focus was for the sample countries in developing policy responses: whether emphasis was placed on the creation of new stand alone measures or more towards the Commission's view of mainstreaming. Responses varied among countries. Estonia stated that the means to effect adaptation was not yet part of the national discussion, as apart from the two-page memorandum from the government no further documentation on adaptation existed. Similarly, Slovakia reported that there was no general focus yet and that there was no discussion on the issue. They did highlight the fact that in their country a number of measures do exist that could potentially be labelled as adaptation (see Section 3.2). In regards to their agricultural strategy, the adaptive measures therein could be seen as an application of pre-existing responses applied with greater focus towards the pressures of climate change. For Poland, the primary focus is solely on mainstreaming. This could be a reflection of the need for broad political support across the ministries in support of the proposed adaptation strategies. In essence it will be easier to secure cooperation from a variety of sectors if they are only required to review how their existing policies could be used to support adaptation. The remainder of the countries with the exception of Lithuania, which did not respond to this question, stated that their primary focus was on a combination of mainstreaming and new policy development.

2.4 Institutional structures supporting adaptation

In the political and policy domain, adaptation falls under the purview of the Ministry of Environment in all countries. In Latvia the Ministry of Environment heads an official government task force which includes experts from other major ministries (Agriculture, Defense, Internal Affairs, External Affairs, Health, Regional Development, Economy and Transport). In Hungary there is an office for adaptation in the ministry. In some countries such as Hungary, Poland, Czech Republic and Slovakia responsibilities are coordinated between the Ministry of Environment and Ministry of Agriculture. Broader inter-ministerial cooperation exits in Slovenia, Hungary and Czech Republic for climate change issues in general in the form of working groups and committees, however there is no adaptation specific focus. For Estonia and Lithuania no other ministries are involved

	NAS present	*NAS proposed*	*NAS not proposed*	*Sectoral strategies present*	*Sectoral strategies proposed*
Czech Republic		Adaptation plan will be incorporated into mitigation plan in 2009			
Estonia		Plan proposed but delayed			
Hungary	Since 2008				
Latvia		Possible plan by end of 2009 based on government adaptation report			
Lithuania			No plan proposed		
Poland				Water, soil protection plans have elements of adaptation	Poland wants adaptation plans for all key sectors
Slovakia			No plan proposed as of yet, want sectoral survey of climate impacts	Water strategy has adaptation	
Slovenia		Completion date uncertain		Agriculture adaptation plan	

Figure 2.2 Adaptation strategies.

with the issue. It is interesting to note that no country reported involvement from the Ministry of [Science and] Education in adaptation affairs.

2.5 Multilevel and private sector cooperation[2]

Multilevel governance; input from all levels and strands of society (local and regional governments, individual stakeholders and the private sector) into decision making processes has become a hallmark in European environmental policy making. The EU's Green and White Papers reinforce this principle in seeking a holistic approach to adaptation across Europe. In seeking to understand how the new Member States are working across levels and engaging parties outside government circles the survey asked three questions: What is the importance of adaptation at the regional[3] and local levels? What is the level of cooperation between the national government and lower administrative units? And, what is the involvement of the private sector?

In all countries, adaptation is, in general, not a concern or of great importance in lower levels of government. The importance of defining the issue and developing appropriate responses was stated to lie with national governments. Awareness of climate change impacts and vulnerability varies across the sample. In Poland and Estonia, regional and local governments are largely unaware of the issue and have taken no measures. For countries such as Hungary there is an awareness of climate related impacts and the need to adapt however, the other levels look to the national government for guidance. Across the board there is experience at the local and regional levels in dealing with extreme weather events such as flooding. The response measures in place though are not part of any climate adaptation strategy and are largely perceived as generic emergency preparation and response actions.

The responses to the question of cooperation between administrative levels were largely dependent on the awareness and level of concern of adaptation within regions and locales. For example in Estonia, there was little knowledge among the *maakonad* (county) officials and as of yet the national government has done little to engage with them. In Poland, despite the reported low level of concern, regions have stated they are willing to cooperate with the national government; however they do not want to initiate any particular action apart from disaster risk management. For countries such as Latvia and Hungary where there is greater awareness among regional and/or local governments, the national government has been engaging them. In the case of Hungary this has taken the form of top-down style of management where the national government has dictated what should be done. For Latvia, the regions are consulted by the National Government prior to any decision being made.

Some of the country respondents took to answering the question of cooperation not in the strict term of cooperation on issues of climate change adaptation but rather more broadly on cooperation between levels on general environmental management. Slovenia, for example, stated that there is very good cooperation between the Ministry of En-

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2 The views in this section are based on interviews with national level authorities, no sub-national authorities were interviewed.

3 Regional here means at the sub-national level. It should be noted that many of the new Member States are comparatively small in terms of territorial area and population compared with the EU-15 states. Political demarcation into regional and local levels thus is not so strict and in many cases there are no "regional" governments. Lower levels of government may consist of counties and municipalities only. These levels however are not administered by the national government.

vironment and local communities in terms of sharing information between the two levels with practical support and guidance being offered to communities for the implementation of environmental measures. In the Czech Republic, the Ministry of Environment has regional offices which both receives advice from and offers advice to regional authorities, the cooperation primarily takes the form of "decide, announce and defend" on the part of the Ministry. For Slovakia, there is no institutionalized structure to support cooperation on adaptation; however, given the small size of the country, regions and municipalities have historically worked in close cooperation with the national government. As to the nature and style of this cooperation, the question was not answered.

Private sector involvement

Support and involvement of the private sector in the development and realization of government sponsored adaptation policies was non-existent in all countries except for Latvia. The private sector there is charged with developing risk-management plans. It was unclear whether these are required by the government and will be fed back into the policy-making process for further elaboration of adaptation policy, or whether they are an outcome of pre-existing policy decisions meant only to serve the private sector. Furthermore it was not specified which sectors were addressed.

Private sector involvement in broader climate related actions was reported in three other countries, i.e. Hungary, Czech Republic and Slovakia. In Hungary this is twofold. Firstly, private companies are required by law to pay a certain portion of their annual profits towards scientific research and development (actual percentage was not stated during interview). This can come either in the form of a direct (earmarked) tax paid directly to the central government, or a company can choose to donate funds directly to a university program or research institute project of their choice. If the money goes to support a research area deemed to be a priority of the national government (e.g. future climate impacts) (see Knowledge Generation below), then they are exempt from paying the tax. Secondly, in 2009 the private sector supported the creation of a climate change awareness raising book for the general public (see Box 2.1).

In Slovakia, the private sector is charged with monitoring environmental changes and reporting these to the Ministry of Environment (the type of monitoring was not specified). In the Czech Republic, it was reported that the private sector is involved in the creation of flood defense systems. In both cases it appears that work is contracted out to companies by the government. This point however was not fully confirmed. In general then it is a bit of a stretch to classify this as evidence of multilevel governance.

2.6 Knowledge Generation

Prior to undertaking any adaptive responses and implementing measures there needs to be an understanding of the potential impacts of climate change on a particular ecological system or socio-economic domain (see IPCC 2007). This point has been emphasized in the White Paper. Identification of impacts requires short and long term monitoring of environmental changes, risk and vulnerability assessments, as well as the use of climate scenarios. Broadly speaking, these activities -while not adaptive responses in that they do not directly reduce climate impacts- can be regarded as a part of the adaptation "process". Thus in aiming to better understand the state of adaptation in countries, attention

needs to be given towards investigating 1) the institutional underpinnings supporting climate research, 2) the state and focus of that research) and 3) the relation between the scientific community and the policy makers. The survey did not ask these questions directly, it focused more on the existence of risk assessments, use of scenarios and the institutions behind them as identified by the government officials.[4] These issues emerged however during the interview discussions.

Looking first at the survey questions, all of the countries stated that, in general, there were studies assessing future climate risks and vulnerabilities. For Estonia these were focused on flooding (urban and coastal zones) carried out by the hydro-meteorological institute of the government. In Slovenia impact studies have been conducted primarily by universities and research institutes, the focus being on agriculture, forestry and tourism. In Poland, water and agriculture have been studied by a range of institutions, including the Meteorology and Water Management Institute to Polish Academy of Sciences. One particular project of note was a study of climate impacts on individual farmers carried out by the Institute of Environmental Protection. Climate impact studies in the Czech Republic are mainly geared towards water management issues and in particular impacts on river basins. Work has been carried out by the hydro-meteorological institute. In Hungary, agricultural and hydrological systems as well as human health are covered by the main universities. Slovakia has a national climate program that is dedicated to knowledge generation and that is comprised of people from Ministry of Environment, Ministry of Agriculture, the hydro-meteorological institute and various universities. The main focus of the study is on hydrological systems, agriculture and forest systems. In 2008, the program produced a comprehensive study on climate change impacts (Climate Change Impacts and Adaptation Measures – NKP 12/08)[5].

The picture is more scattered with respect to the survey questions on the generation of climate impact scenarios and the use of scenarios in the creation of adaptation policy responses. While all the countries reported the existence of climate related impact scenarios in the sectors reported above, use of these scenarios as input for policy making appeared only to exist in Poland, Slovenia, Latvia and Hungary. Details on the specific scenarios driven policies was however limited. In Hungary a new heat-wave warning system was developed and the scenarios have led to "better" planning of agricultural production. Slovenia reported that the concrete measures in their agricultural strategy were derived from scenarios but came more in the form of win-win recommendations for the sector than enforceable measures. They also reported that there was a high degree of uncertainty surrounding the use of impact models and scenarios. Slovenia is a small country that has three distinct and different climatic zones (Mediterranean, mountain and continental). As of yet, models detailed enough in scale to capture this complexity have not yet been applied in Slovenia, thus studies often providing mixed results for the country as a whole.

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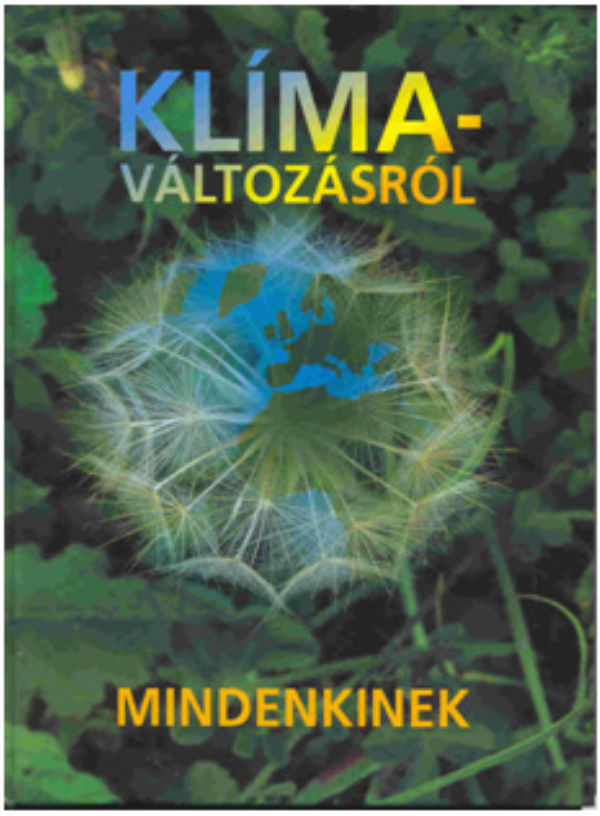
[4] In should be stressed in this section that much of the information was provided by government officials and in large part is a reflection of their understanding. Obviously, given the nature and independence of academic work there is in all countries a wider array of climate studies than reported here (see e.g. CIRCLE project 2009). What is interesting to note is the difference between what policy makers report and the actual state or level of research being undertaken.

[5] Despite the title the report does not introduce adaptation measures.

One of the main challenges for all the countries in the area of knowledge generation is the communication and translation of research results to the policy making circles. While there are either national programs studying climate impacts or government sponsored studies there appears to be a gap between what is produced and what is acted upon. Slovakia in particular is cognizant of this and has stressed that within the Ministry of Environment they are considering a means of more systematically assessing research so as to feed into the policy cycle. This gap between research and policy in some regards reflects the institutional structure supporting adaptation in these countries. It will be recalled that by in large no country has a central coordinating office that deals exclusively with climate impacts and adaptation issues. Moreover, except for Hungary, there are no adaptation strategies that might serve as a bridge to link these issues. The gap might also be explained by the novelty in addressing climate change adaptation. As the previous phase of research showed, adaptation did not enter the policy agenda in most of these countries until the period 2004- 2006, (if not later) with the release of the 4th cycle of UNFCCC National Communications. It might also be further postulated that the low policy level in these countries (see introduction) is a result of this disconnect.

Bringing climate change to the Hungarian public



In 2008, Corvinus University of Budapest with the support of the national government and the private sector created a book, *About Climate Change: For all* aimed at informing the general public about climate change. This 200 page public raising awareness document covers topics such as water systems, ecosystems, human & animal health, food safety and climate policy. The book also provides guidance to individuals and communities on steps they can take to mitigate and adapt to climate change. The book was originally distributed for free throughout the country.

Box 2.1 Hungarian climate book.

Setting the priority of research

One other point to be mentioned in relation to knowledge generation is the creation of a research agenda and setting priorities of what should be investigated. The survey did address this issue in Section 3 and it was revealed through the interviews that research agendas were largely set by the Ministries of Environment, Agriculture and in some cases Education. National science foundations also play a role. Interestingly, the

Ministry of Education was never mentioned as being part of the institutional structure of adaptation.

2.7 Discussion

As a subfield of climate change policy, adaptation is still very much in a nascent stage in Central and Eastern Europe. This is first and foremost evidenced by the level of priority afforded to the issue in the sample countries, *priority, but in initial phase* or *not a priority*. Further buttressing this is perhaps the lack of national adaptation strategies (with the exception of Hungary). While a national adaptation strategy cannot necessarily be taken as an overall indicator of progress, combined with the priorities of the countries along with the stated desire for a strategy as expressed by many, it does offer solid indication that there is still much work to be done. It should be stressed that we are not unequivocally implying that a NAS be required, the sectoral strategies being pursued by Poland may indeed be sufficient. Moreover, NASs can vary greatly in their intent, content and level of detail for prescribed action; one only need compare the strategies of Finland and the UK to see this (Swart et al. 2009). Overall however, a well thought out and constructed strategy can help frame and offer direction for institutional structuring, multi-level governance and the generation of knowledge.

Further evidence of adaptation's novelty can be seen in the way it is institutionally structured in the countries as compared to mitigation. Whereas mitigation may fall under the purview of the Ministry of Environments, it is characterized in the UNFCCC National Communications as a responsibility for virtually all the ministerial sectors of government. Adaptation on the other hand, is largely the concern of the Ministries of Environment and to a lesser degree Agriculture. As stated, some countries such as Hungary have an adaptation office within the Ministry of Environment and for Latvia there is a government task force on adaptation. Even in the countries that have inter-ministerial climate change task forces or committees, adaptation is not a mainstay on their agendas. Similar with the issue of NASs, we are not overtly implying that there needs to be a formal institutional structure that demands cooperation across the sectors but rather that input from these sectors may help to create more robust policy responses.

In terms of cooperation between the national government and regional and local levels it must be reiterated that each country is unique in their administrative structuring due to either geographical size and/or population. For example a country such as Slovenia has 2 million inhabitants spread over an area of only 20 thousand square kilometres (60% of which is forested) (see Table 1.1). Essentially it is a country of municipalities led by a national government. Nevertheless, as the survey results showed, awareness of adaptation is low at these sub-national levels of government. It is at these levels though where climate change will potentially have its greatest impacts. While the regions and municipalities in all the countries are experienced in some form of disaster preparation and response, and receive support from the national government for such measures, adaptation is much broader than disaster risk reduction and risk management. Adaptation measures need to include *inter alia* probabilistic risk and impact assessments based on future climate scenarios. This in turn requires a suitable amount of knowledge generation and the transmission of that knowledge across all levels of government.

As has been alluded to above, the generation of knowledge on climate impacts and vulnerabilities for most of the countries is new but quite strong in a limited number of domains (agriculture and water). Strong to the degree that there are multiple knowledge streams (independent research institutes, government institutes and universities) currently conducting research. The challenge has been interpreting the results such that appropriate response measure can be derived. This again is dependent upon the institutional frameworks in place and the priority of adaptation for policy makers. The higher the priority is and the stronger the institutional networks are the better the environment is for policy development.

As part of this discussion it is also worth reflecting upon why there appears to have been a "slow" policy response towards adaptation as it relates to issues on priorities, institutions, cooperation and knowledge generation. Reading between the lines of the interviews three possible answers come to the fore.

First, government response to climate change is still largely mitigation focused. Second, since the 2007 Green Paper squarely put adaptation on the European agenda some of the governments have undergone a transition and shift priorities. And third, the current world wide recession has caused a narrowing of government focus and a trimming of national budgets with money being spent only on core issues.

In regards to the first point, during the introductory phase of the interviews, participants were asked to offer their views openly on what climate change adaptation meant to them. In most of these cases the discussion began with a review of the country's mitigation activities and achievements. Mitigation activities were also a recurrent topic in regards to the discussions on institutional setup, and knowledge generation. Often direct questions had to be asked as to how the responses related to the country's adaptation activities or the conversation steered back towards adaptation. This is not to suggest that adaptation and mitigation activities cannot be closely related nor does it challenge the competence of the interviewees. It simply offers an indication that climate change as an issue may still be heavily weighted towards mitigation issues; that adaptation as a subject in its own right is still emerging.

In some degree this might be explained by the development of climate mitigation policy in Central and Eastern Europe as compared to their western counterparts. It will be recalled that after a sharp decline in economic activity and heavy industry in the 1990s and the determining of individual country mitigation targets under the Kyoto Protocol, the countries of the Eastern Bloc were offered "room to grow". Unlike many of the larger EU-15 countries[6], they were not burdened with trying to cut their greenhouse gas emissions because additional efforts to curb greenhouse gas emissions would disproportionally affect their economies. This in turn may have delayed the development of an overall climate policy. The study of and responses to climate change vulnerabilities and impacts did not appear in earnest on the agendas of Annex I countries until after the 2001 IPCC's Third Assessment Report and it was not until the period 2004-2006 that NASs began to appear in the older EU Member States (Massey 2007). Given then that adaptation has historically proceeded mitigation, if it is assumed that mitigation efforts got off to a rela-

[6] Some EU-15 countries such as Spain were also allowed to increase their emissions under the EU Burden Sharing agreement.

tively slower start in Central and Eastern Europe, then the discussions in the interviews are not without warrant.

Looking at the second and third points behind the "slow" response to adaptation the following was observed. In attempting to contact people for interviews during the autumn of 2008 and winter of 2009, a handful of potential respondents from the government and ministries stated that their governments and/or ministers had recently been or were being changed. As no new policy agendas were yet in place they were reluctant to discuss their current activities. Subsequently during the interviews, respondents mentioned that the global recession was having an impact on their governments and that funding for programs that they themselves were working on had been reduced or cut. A quick review of *The Economist* website on country economic profiles (see http://www.economist.com/countries/) confirms that many of the countries in this study were facing severe economic downturns, with an average decline in real GDP at -6.5% in 2009 for these eight countries.

One final point for this discussion section is the role of the EU in influencing the issue of adaptation. In all of the country interviews[7] it was stated either that the country was very much looking forward to the release of the adaptation White Paper so as to offer guidance on actions and/or provide political impetus to the central government to address the issue; or it was stated more broadly that the country took very seriously the decisions and declarations of the Commission in this field. In essence these countries might be characterized as "EU followers". A number of reasons may account for this; one perhaps is their recent accession to the EU in 2004 and the need to fulfil the Union's array of economic policy and environmental legislation.[8] This dynamic of EU follower may also account in some part for countries stating that their adaptation policy would focus on mainstreaming, a central tenet of the EU position. In sum, it would appear that the European Union holds significant sway in helping to set the agenda on adaptation and could be a strong driving force in pushing the issue forward towards greater implementation.

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7 Except for Latvia and Lithuania as they were not directly interviewed.

8 For an overview and discussion of each country's ascension procedures and commitments see the second cycle of the OCED's Environmental Performance Reviews.

3. Policies

3.1 Presentation of survey results

The second major section of the survey sought to present the individual countries with previously collected data and solicit comment on how well these data reflected the current situation in terms of their adaptation policy actions (the number and types of policy concerns, recommendations and measures) (see Box 3.1 below for definitions). This section also asked questions regarding the movement of listed adaptation actions from either concerns to recommendations or recommendations to measures. Finally, it asked respondents to identify, if possible, any new adaptation actions that were not listed (see Appendix II for an overview of the adaptation actions presented to each country).

Definitions of adaptation policy actions

1. **Policy concern**: A policy concern is characterized by a general statement on specific issue areas but offers no concrete plan of action. For example a concern may state, "In the next 10 years we foresee an increase in the incidence of heat waves, action must be taken". Here the issue of heat waves is addressed but no further action specified.
2. **Policy recommendation**: A policy recommendation puts forth a specific recommendation to address a specific problem. For example, "It is recommended that in the next 5 years we allocate 20 million Euros to the development of a heat wave early warning system."
3. **Policy measure**: This is an actual implemented policy measure (note: measures motivated out of climate concerns, or at least measures that acknowledge concerns of climate change) such as the construction of a sea wall or the implementation of an early warning system to detect heat waves.

Box 3.1 Definitions of adaptation policy actions (from Massey, 2007).

This attempt at assessing the movement of policy actions -especially on an individual basis for each action- proved to be very difficult. First, it required the interviewees to be familiar with each action listed. Even with the survey being sent well ahead of the interview and an average of 15 individual actions per country, respondents were not so well versed with each item as to offer a definitive answer for each one. The limited knowledge of each item combined with the time allotted for the interview (usually between 60 and 90 minutes) also made the section of the survey challenging. The answers to the questions therefore were therefore not addressed with the degree of specificity that was originally intended; nevertheless most respondents were careful to give their fullest attention to this section.

In seeking to validate the results of the previous work, four countries (i.e.) Poland, Estonia Slovenia and Slovakia) stated that the data presented were a good assessment and representation of their country's actions in terms of the totality of actions. In terms of movement of policy actions across levels, Slovakia stated that some steps had been taken

to implement an earlier policy recommendation to improve the monitoring of water resources. Interestingly, Slovakia also pointed out that one of the recommendations on reducing consumer water demand through pricing policies had been taken off the agenda. According to the interviewees, since the privatization of water services began, the price of water has risen almost 100 fold, reducing consumer demand significantly. In some areas of the country they stated, personal water use is so low due to the price that it is beginning to have an impact on human health. Further discussion on this point however was not pursued.

For the remainder of these countries no definitive answer was given on policy movement. Slovenia stated that in fact, since its last UNFCCC National Communication in 2006 no more concrete policy actions had been undertaken. In terms of the creation of new actions in these four countries, only Slovakia responded positively with the creation of a heat wave early warning system.

For the countries of Hungary, the Czech Republic and Latvia, the data presented from the 2nd phase of research were reported to be out of date and not representative of the current condition in terms of both the number of actions and the level of actions.

In Hungary there are now systems for monitoring heat waves and providing early warnings down to the local levels. These systems include a set of detailed response measures for hospitals and other health care providers. The national hazard management system was also reformed in 2006. One interesting anecdote behind this reform was that based upon a survey by the national government of local communities, it was revealed that many local communities lacked an adequate number of chainsaws to clear away trees quickly after extreme weather events. Chainsaws were later provided by the national government. The point that was stressed by the interviewee was that sometimes simple measures such as a survey can highlight significant problems that can be easily solved. The interviewee also went on to state that the survey showed there was a shortage of emergency response vehicles such as ambulances. Unfortunately there are at present insufficient resources to fully address this shortcoming.

For the Czech Republic, the interviewee stated that there were many more policy measures than were reported in survey and that more could be expected by the mid to end of 2009, after the release of the White Paper and the completion of their new Climate Protection Program (see previous section). At present, updated and new actions include: a review to enhance the security of dams; enhanced flood retention areas; risk assessments and mapping of areas vulnerable to vector-borne diseases from insects along with early warning systems of noisome insect infestation; land adjustments and the rezoning and break-up of former communist state farms. Further actions include: the Health 21 program which is identifying populations and locals vulnerable to health risks *including* climate change and a recommendation that farmers use drought resistant crops. A final measure reported were efforts to increase overseas development aid in the field of health and water management. How this was explicitly linked to climate change adaptation was not further discussed.

Latvia reported (in written format) a number of programs and plans. These did not directly correlate to the data from the previous phase of research as the list provided details a range of government sponsored programs and not individual policy measures.[9]

As stated in Section 1, Lithuania was the only country that declined to be interviewed or complete the survey. The document that was obtained regarding their adaptation activities lists seven "adaptation policies/measures". Apart from the action on coastal zone management listed in our data, it was difficult to find a correlation between our data set and these seven actions. For more details please see Appendix II.

3.2 Discussion

As mentioned above, this portion of the survey was the most challenging in garnering specific details. One Hungarian interviewee aptly stated, "There is no accurate list of measures." To a certain degree his remark rings true. One of the overall challenges in trying to assess adaptation activities is pinpointing precisely and exactly actions that can be labelled as adaptation. The problem with this task however revolves around what the definition of adaptation is and the multiplicity of actions that can potentially be labelled adaptation. According to the EU, "Adaptation actions are taken to cope with a changing climate, e.g. increased rainfall, higher temperatures, scarcer water resources or more frequent storms, at present or anticipating such changes in future. Adaptation aims at reducing the risk and damage from current and future harmful impacts cost-effectively or exploiting potential benefits" (SEC COM (2007) 354, final; 3). Therefore, should an action to protect against floods that was implemented 20 years ago now be regarded as an adaptation measure? Especially if its original intent was not climate impacts driven. Moreover is a program that studies endangered species to be considered an adaptation action?

The response of the sample countries in regards to adaptation actions they have taken reveals the fuzziness of this issue. In many cases it is hard to see how an action taken is related to adaptation as defined by the EU. For example, how does a law authorizing a country's participation in the Kyoto Protocol's flexible mechanisms qualify as adaptation? Or a law on territorial planning? (See Appendix II, Latvia.)

One way of thinking would be to draw a distinction between an adaptation action, ones that were conceived as a response to climate change and firmly rooted in addressing climate related impacts, and actions that *facilitate* adaptation. Actions whose original intents were not climate impacts based but brought residual benefits in reducing (or capitalizing) on those impacts (e.g. some flood defense mechanisms). In the end though, this line of thought could be seen as an issue of semantics given that the overall thrust of adaptation in the view of the Commission is to lessen the impacts of climate change. What measure is labelled that achieves that end perhaps is not so significant. Moreover, given that mainstreaming -the refocusing of existing measures- is one of the central tenets of the EU adaptation agenda, such a distinction will be even harder to make in the future.

What evolves from this discussion and in some degree from this survey is twofold. One, that countries are at liberty to choose what they define as an adaptation action as long as they can show how that action helps to mitigate the impacts of climate change. That they are not applying window dressing to unrelated actions simply to bolster their adaptation

[9] For a summary of these, see Appendix II.

portfolio in the eyes of others.[10] And two, that information on their adaptation actions however defined, be made widely available to serve as an example for other countries to adopt good practices.

[10] It should be recalled from Section 2 that these countries are to some degree EU followers and have endeavored to comply with all EU Communications and Directives. Climate change adaptation is at present one issue that is receiving a lot of attention in the Commission, thus implicitly the feeling may exist that these countries need to demonstrate what actions they have taken, no matter how remote those actions may be from adaptation as defined by the Commission. Secondly, as was stated, the concept of climate change appears still to be heavily viewed in terms of mitigation, which raises the question of how much thought has gone into identifying the adaptation actions that are now reported.

4. Domains and constraints

One of the predominant purposes of the previous phase of research was to obtain an overview of where countries were concentrating their adaptation actions in terms of vulnerable sectors and domains. To that end, the project categorized the identified actions (see Section 3) along a set of 10 pre-defined categories or adaptation aims/domains[11] (for definitions see Box 4.1). While a categorized knowledge of a country's aims provided preliminary insight into where countries were focusing their policy efforts, the previous findings did little to offer an explanation of the reasoning behind their selection. The survey sought to go beyond this limitation by questioning why and how the aims were identified; who was responsible for them; and why of the 10 aims the project created, some were not addressed. The survey further asked the respondents to (if possible) rank the aims in terms of importance and comment on the areas where more research or policy attention would be needed. Finally, and in conclusion, the survey asked the respondents to discuss the limitations and constraints in undertaking adaptation activities in their country.

Definitions of Adaptation aims & domains

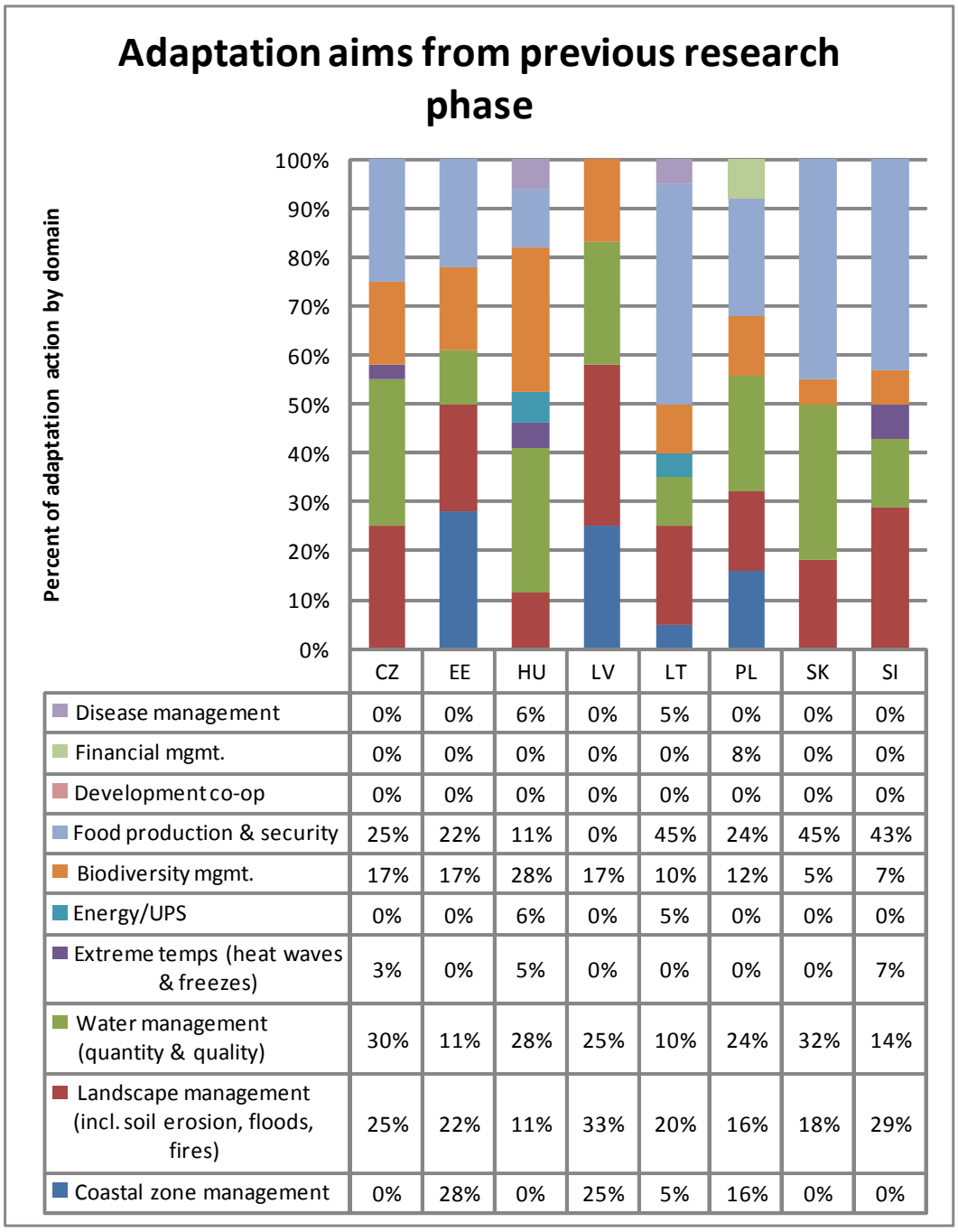
- Coastal zone management
- Landscape management (including soil erosion, floods, fires and forestry management)
- Water management (including quantity and quality).
- Extreme temperature (including heat waves and cold)
- Energy, security of supply of energy
- Biodiversity management
- Financial management (insurance and financial markets)
- Health and disease management
- Agriculture, and food security
- Development co-operation

Box 4.1 Definitions of adaptation aims and domains (from Massey, 2007).

4.1 Adaptation aims and domains

As with the previous section of the survey on adaptation actions, this section began by presenting the collected data on adaptation aims and asked the respondents to comment on the accuracy of the information (see Figure 4.1 for aggregated results). To some degree this section served as a cross-check for the previous section in that it presented the same data but in a different format.

[11] See Massey & Bergsma 2008 for an explanation of how these domains were selected.



	CZ	EE	HU	LV	LT	PL	SK	SI
Disease management	0%	0%	6%	0%	5%	0%	0%	0%
Financial mgmt.	0%	0%	0%	0%	0%	8%	0%	0%
Development co-op	0%	0%	0%	0%	0%	0%	0%	0%
Food production & security	25%	22%	11%	0%	45%	24%	45%	43%
Biodiversity mgmt.	17%	17%	28%	17%	10%	12%	5%	7%
Energy/UPS	0%	0%	6%	0%	5%	0%	0%	0%
Extreme temps (heat waves & freezes)	3%	0%	5%	0%	0%	0%	0%	7%
Water management (quantity & quality)	30%	11%	28%	25%	10%	24%	32%	14%
Landscape management (incl. soil erosion, floods, fires)	25%	22%	11%	33%	20%	16%	18%	29%
Coastal zone management	0%	28%	0%	25%	5%	16%	0%	0%

Figure 4.1 Adaptation aims by country (data from Massey & Bergsma, 2008).

Again, Slovakia, Slovenia, Poland and Estonia all reported that our research captured a relatively accurate picture of the spread and concentration of adaptation aims. Slovenia did add that the reported attention towards food production & security (agriculture) and extreme temperatures might be slightly overestimated. Similar, Poland suggested that attention to water management might be overestimated. It should be recalled that the representation of the aims includes the number of policy actions (concerns and recommendations) and not just implemented measures. During the interviews there appeared at times slight confusion on this point.

Hungary, the Czech Republic and Latvia reported that the relative emphasis given to the domains was more or less accurate. However, the information could be supplemented. For all three countries, this included human health and disease management. While both had already been a previous aim for Hungary, it was new for the others. Latvia also reported new aims in the insurance sector (financial management), landscape management in the form of responding to natural disasters, food security and energy. The Czech Republic added development co-operation (*inter alia* with Ecuador, Ethiopia Mongolia, Peru).

For all the countries in the sample the dominant aims were still related to water management, landscape management and agriculture. On how the adaptation aims were identified, all countries stated they were identified and derived through a combination of domestic (primarily) and non-domestic risk assessments, studies, and in some cases, climate scenarios. This supports the findings from the Knowledge generation section (2.6) above.

The entities responsible for identifying the aims were well in accord with the institutional set up and responsibilities surrounding adaptation. Thus the Ministry of Environment was most listed by the respondents along with the Ministry of Agriculture and government research institutes; most notably hydro-meteorological institutes. Universities and research programs were also stated to have a role.

The survey respondents were also asked to rank the adaptation aims covered in terms of importance. The overall majority stated that water issues in general and agriculture were the most important. Other domains that emerged after these were forestry, health, and biodiversity management. These results strongly reflect the findings from the previous study in Figure 4.1.

The question of why certain adaptation aims are not covered or covered in a limited fashion generated some interesting discussions during the interviews. Polish responded that it was difficult to find experts in many of the issues covered, especially in the field of climate change and biodiversity management. The Czech Republic stated that adaptation was a new word and concept: that while there may be actions that contribute to addressing climate impacts, they have not yet been labelled as adaptation thus falling outside the spectrum of adaptation activities (see section 3.2). They further added that there was little or no research taking place in the Czech Republic outside the dominant aims of agriculture, water and land management. In Estonia, the reason was related to the lack of research and general perception of particular aims (e.g. health and disease management). In Slovenia the point was made of not having yet established the link between a domain and its relation to climate change adaptation, such as energy for example. They also stated that the Ministry was eager to incorporate biodiversity issues into their adaptation actions but as of yet were uncertain how the fit should be made. Slovakia mentioned that in general, according to the IPCC scenarios, they were not likely to be strongly impacted by climate change on domains not covered. Additionally, there was a lack of research looking at all the domains. Finally, Latvia stated they were now addressing all the aims on the list.

The second to last question of the survey asked respondents to comment on where and whether more research or policy was needed on the adaptation domains. In general the responses were not detailed but consisting of affirmatives that more research was needed

across all the domains. The issue of new policies per se did not come up. Some respondents were specific. Hungary emphasized the point that there was a greater need to translate existing scientific findings into the public sector, that much of the scientific information generated did not reach the desks of public. An issue raised earlier. Slovakia stressed the need for coordinated and integrated research that linked climate impacts across socio-economic sectors. Estonia made the case for more monitoring of environmental conditions and Poland stated that coastal zones and health deserved more research attention.

Finally, the respondents were asked to characterize some of the main constraints their country faced in undertaking adaptation. The questionnaire supplied a list of examples but respondents were encouraged to answer openly. In general this question was meant to serve as a reflection on how adaptation might be better approached. The four main constraints that emerged from the countries as a group (in order) were: Knowledge and research; Financial; Institutional Capacity; and Lack of networks.

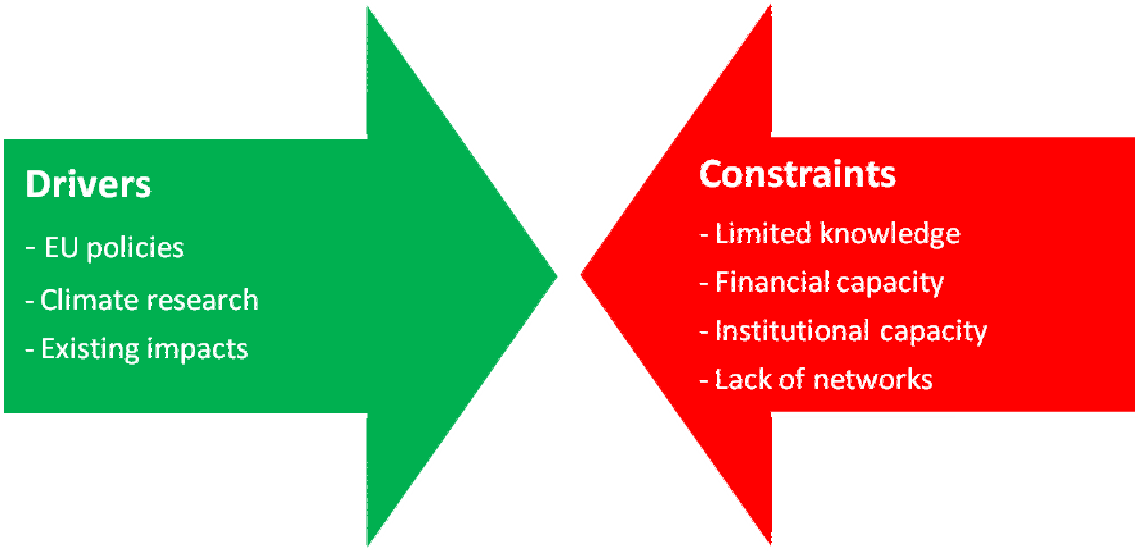


Figure 4.2 Adaptation policy drivers and constraints.

4.2 Discussion

In reviewing the findings from this section a few points of discussion arise regarding how the case countries characterize their adaptation actions and what the driving forces appear to be for policy stagnation and movement in particular domains. As we have seen, half of the countries stated that the results of the previous phase of research represented a relatively accurate picture while others stated that there was some headway in expanding their concerns over various impacted domains, but that new efforts were primarily concentrated on existing concerns.

What might account for this dynamic? A look at the constraints that the countries are facing may offer some explanation. As aforementioned, the main factors inhibiting their adaptation efforts are lack of knowledge and research; financial support; institutional ca-

pacity; and networks. In some respect these inhibitions have shaped how their current adaptation aims/domains profiles are constructed and the priorities afforded to certain domains. As we have seen, the three primary areas of concern in all the countries are either, agriculture, water or land management. Moreover, while many of the adaptation actions in these domains were derived from domestic risk assessments and studies, the studies were carried out in large part by the Ministries of Environment or Agriculture and by hydro-metrological institutes; three institutions whose competencies match the dominant areas of concern. As the Polish interviewee frankly responded, when asked why so little attention was given to other domains such as biodiversity, he said that, "it is difficult to find experts on other issues. That it is very difficult [in Poland] to find biologists and ecologists who understand climate issues." His response is perhaps emblematic of the constraints at work. Agriculture, water, and forestry are given priority because that is where the knowledge base rests and where the best resources are financially available and institutionally secured. As a result it could be posited that there is a form of intellectual and institutional lock-in at play which limits the focus of research agendas to a small field of climate impacts.

Obviously the priorities of adaptation research and policy action should be on those domains where impacts are perceived to be greatest. The perception of what is important however is likely subjective, especially if seen in light of the absence of a broad research agenda to assess climate impacts across a wide spectrum of domains. As the survey results showed, all the countries stated that more research was needed across the board.

While not trying to diminish the "importance" of domains such as water management, agriculture or land management, for agriculture there appear to be other factors contributing to its predominance among adaptation domains for many of the countries, factors that may not necessarily be climate impact driven. As the IPCC's Fourth Assessment Report, *Impacts, Adaptation and Vulnerability* (IPCC 2007) states, agricultural productivity in Europe, especially Northern Europe, is expected to increase over the coming decades as a result of greater atmospheric CO_2 concentrations. Given this, it might be expected that agriculture would receive less adaptation attention (even with a component of adaptation being the capitalization on a changing climate, see the EC Green Paper); that other domains might take predominance. The agricultural sector though, as many of the survey respondents elaborated, not only enjoys a high institutional status (hence the intellectual and institutional lock-in) but as a field of study, agricultural production is easily quantifiable, impacts on the domain are easily identifiable, and agriculture is culturally a very important part of the historical fabric of the societies. Moreover, in some countries a large share of the population is directly employed in this sector (Latvia, Lithuania, and Poland; see Table 1.1).

The point of consideration is not whether agriculture is undervalued or overvalued (assuming that a relative weight can actually be ascribed to it) but rather that when looking at the broader context of adaptation activities, are some domains being given little attention as a result of lock-in, cultural preferences and difficulty of research? This research and the interviews conducted suggest that this might be the case. That the larger institutional structures supporting adaptation activities in combination with the constraints surrounding adaptation can lead perhaps to a limited focus on certain domains.

In some respects a handful of the countries are aware of this, pointing out that the adaptation agenda could be broadened out with greater involvement of Ministries of Education or science foundations in setting research agendas for studying climate impacts across domains and through better national and international networks where wider discussions on adaptation issues can occur. These actions require adequate financial resources (which are at present lacking in many places) and strong political commitments on the part of Member State governments. It is in these two areas where many of the countries stated the EU could provide the driving force. As discussed in the previous sections, the EU is seen as having significant influence, a clear message from the Commission on what impacts should be considered and how they could be, from the perspective of institutional setup, could help in focusing resources and priorities in the countries thus broadening the scope of adaptation. To a certain degree, the EU has taken some initial steps in this direction with the proposal of an EU Clearinghouse on adaptation and the White Paper's proposal for an EU Adaptation Framework.

5. Summary and conclusions

This report has highlighted how some of the Member States of the European Union in Central and Eastern Europe are responding to the need to adapt to potential climate change impacts. In assessing the priorities and current institutional structures supporting adaptation; the means of knowledge generation; current and potential adaptation actions; as well as domains and constraints, several points of consideration emerge. These points are for the European Commission, which is working to define its role to contribute to national adaptation efforts, and for the Member States who are working towards implementation of adaptation measures. Prior to highlighting these points, it is worth summarizing the findings.

5.1 Summary

The concept and implementation of adaptation is still relatively new for the countries of Central and Eastern Europe. This is evidenced by a number of interrelated factors. Adaptation at present is self described as being a low priority or a priority but in initial phase of the central government. Adaptation is often not given a clear distinction between climate change mitigation efforts and activities. Only one country (Hungary) so far has created a national adaptation strategy and not every country is committed to pursuing one. Institutionally, adaptation policy, where it exists, is largely the domain of the Ministries of Environment with input from Ministries of Agriculture. With the exception of Latvia, there are no established inter-ministerial working groups and cooperation across key ministries is largely absent. While there appears to be cooperation between different levels of government (national and regional/local) on issues of disaster risk reduction and risk management, this often falls outside the setting of long-term adaptation to climate change related risks and impacts. Moreover, lower levels of government do not appear to be cognizant of climate change adaptation, according to national level policymakers.

Adaptation's novelty is also reflected in the limited number of policy actions (as compared to various EU-15 MSs and the narrow diversity of domains they cover (Massey & Bergsma 2008). This in part is related to the factors listed above and also connected to what and how climate change impact knowledge is generated and communicated. The majority of climate research falls under the domains of agriculture, water management and land management. While not trying to diminish the importance of these domains, especially issues of water quantity and quality, much of the research in these domains (predominantly agriculture) appears to be driven by intellectual and institutional lock-in. Because of the nascent institutional structure supporting adaptation, combined with cultural preferences, research and/or studies in other domains appears to be shortcoming. An added point is the relation between science and policy. Many of the countries acknowledged the difficulty of transmitting results and knowledge into policy circles.

While the dynamics of knowledge generation and translation contribute to the limited number of policy actions so do issues of nomenclature on how to define an adaptation action. On the one hand, some countries are labelling activities as "adaptation" which on the surface appear to have little relevance to responding to potential climate impacts. On the other hand, countries acknowledge that there probably are research and policy activi-

ties that could potentially be labelled as "adaptation" but since they are not labelled as such, they fall outside the view of the Ministry of Environment. The fuzziness surrounding what is and what is not adaptation, speaks again to the institutional structure of adaptation and the lack of communication across sectors and levels of government (including the private sector). It is also an indication that adaptation as a concept is still new.

5.2 Points of consideration

Despite the novelty of this issue and the constraints each country in this study is facing, we must look at the country actions within the larger framework of adaptation in Europe. Responding to the potential impacts of climate change is new not only for these eight countries but for many Member States and the Commission alike. It was only in 2007 that Green Paper distilled some of the notions around the EU that action must be taken and that adaptation was squarely put on the European agenda. It was only in 2009 (when much of the research for this report was being undertaken) that the White Paper helped further refine what and how adaptation might look like for the MSs and the Union. Moreover, the Commission itself is just beginning the process of implementing the actions listed in the White Paper and encouraging the MS to do likewise. Throughout this report the eight countries are often presented in contrast to the countries of the EU-15.Only six of these themselves have adopted a national adaptation strategy (see EEA 2008). Certainly some of the EU-15 MSs are well advanced in their institutional structures, research agendas, and policy responses, but they are also struggling with similar issues as our case countries (see Swart et al. 2009). As was mentioned, some of our study countries are slightly behind their EU-15 counterparts as a result of coming to the issue of climate change later due to generous GHG reduction targets delaying discussions in national governments.

Whatever the case, throughout the interviews for this project, there appeared to be high recognition of the constraints limiting some aspects of adaptation, and though little was said on how these would be addressed, recognizing they exist is a positive sign. Also apparent was a sense of optimism that climate impact issues will be dealt with moving forward, especially with a strong push from the EU. That push will ostensibly come from the White Paper and the proposed EU Adaptation Framework, which sets out a four pillar agenda for the period 2009-2012. While the agenda directly targets the Commission itself, it provides a framework of thinking that could be adopted by the Member States alike. Furthermore the White Paper makes explicit that the success of EU adaptation policy will require participation from, "national, regional and local authorities" (COM (2009) 147, final: 7). As part of that participation the Commission plans to create an Impact and Adaptation Steering Group (IASG) composed of Member States and technical experts. Involvement of the Central and Eastern European countries in the IASG may help to directly address some of the constraints to adaptation such as lack of networks and limited knowledge.

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Appendix I. Sample survey

A. Institutional

Priorities and Institutions

A.1 What is the priority of adaptation for your government?

1. Not a priority.

2. Low priority.

3. Priority, but initial phase.

4. High priority.

A.2 Is there/ will there be an adaptation strategy or plan (since when)?

A.3 Are there any legal documents or acts establishing adaptation as a policy agenda item (since when)?

A.4 Is there a lead ministry or an official task force that governs adaption (since when)?

A.5 Are there offices in various ministries that cover adaptation (since when)? Which ministries?

A.6 Is there a focus in adaptation policy of integrating/mainstreaming adaptation practices into current sector policies or rather the development of stand alone adaptation policies?

1. The primary focus is on mainstreaming.

2. The primary focus is on the creation of new policies.

3. A combination of mainstreaming and new policy development.

4. There is no primary focus/not yet decided.

Cooperation

A.7 Is adaptation a more important policy issue for the national, regional or local government?

A.8 What is the level of cooperation of regional or local level governments in the development and realization of adaptation policies?

1. *Regional and/or local governments play a major role in cooperating with the national government.*
2. *Regional and/or local governments are consulted and provide minor input.*
3. *Regional and/or local governments are informed of decisions but provide no input.*
4. *Regional and/or local governments are not part of the process.*

A.9 Is there a role for the private sector in the development and realization of adaptation policies? Have they played any role so far?

Knowledge generation

A.10 In general, are there studies in your country assessing future climate risks and vulnerabilities?

A.11 In general, are there scenarios in your country that have been created based upon future climate risks and vulnerabilities?

A.12 Have these scenarios been used to develop adaptation actions for your country?

B. Policies

Identified polices

Based upon a previous study conducted by our institute we have identified from your UNFCCC National Communications that at the national level your country has approximately: **5 Policy concerns, 13 Policy recommendations, 0 Policy measures.**

Definitions

1. **Policy concern**: A policy concern is characterized by a general statement on specific issue areas but offers no concrete plan of action. For example a concern may state, "In the next 10 years we foresee an increase in the incidence of heat waves, action must be taken". Here the issue of heat waves is addressed but no further action specified.
2. **Policy recommendation**: A policy recommendation puts forth a specific recommendation to address a specific problem. For example, "It is recommended that in the next 5 years we allocate 20 million Euros to the development of a heat wave early warning system."
3. **Policy measure**: This is an actual implemented policy measure (note: measures motivated out of climate concerns, or at least measures that acknowledge concerns of climate change) such as the construction of a sea wall or the implementation of an early warning system to detect heat waves.

The individual concerns, recommendations and measures are detailed in the table below.

Table I.1 Table listing your country's identified concerns, recommendations and measures.

Policy concerns	Policy recommendations	Policy measures
Choice of appropriate plants for agriculture	Ensure appropriate water quality	
Change in land-use and crop structure	Prevention of soil desiccation & erosion	
Progressive regionalization of agricultural production	Reduce water losses in industry and municipal economy	
Improvement of agricultural production efficiency	Enhance water storage capacity , particularly through small retention	
Substantial organizational changes in agriculture and higher capital outlays supported by external financing of agriculture	Enhance the resistance of forest ecosystems to temperature and precipitation variation	

Policy concerns	Policy recommendations	Policy measures
	Integrate expected climate change into the principles of silviculture and forest management instruction	
	For coastal zones, conduct systematic measures to track climate change, on an operational basis, including the marine system observations and predictions of hydro meteorological conditions within the framework of the global observation network.	
	Conduct analytical studies on the sensitivity of the Polish coastal zone to sea level change	
	Implement the strategy for the protection of the Polish coast against the effects of sea level change e.g. through the integrated management of coastal zones in the Baltic states	
	Increase capital outlays supported by external financing for coastal zone management	
	Introduction of technologies rationally using water resources and the longer vegetation season	
	Creation of water infrastructure, water reservoirs and intakes	

Questions:

B.1 Would you say that is an accurate assessment of your country's actions?

B.2 Has there been any action on creating concrete recommendations or measures out of the concerns listed above?

B.3 Has there been any action on further moving the recommendations listed above to policy measures?

B.4 Are there any new or existing concerns, recommendations or measures that are not listed above?

C. Procedures and constraints

Domains and aims of adaptation

Based upon a previous study by our institute we have identified from your UNFCCC National Communications that the majority of your adaption actions are targeted towards (please see list and below):

- Coastal zone management
- Landscape management (including soil erosion, floods, and fires etc.)
- Financial management
- Water management (including quantity & quality)
- Biodiversity management
- Food production and security

Definitions of Adaptation aims & domains

- **Coastal zone management**
- **Landscape management** (including soil erosion, floods, fires and forestry management)
- **Water management** (including quantity and quality).
- **Extreme temperature** (including heat waves and cold)
- **Energy**, security of supply of energy
- **Biodiversity management**
- **Financial management** (insurance and financial markets)
- **Health and disease management**
- **Agriculture, and food security**
- Development co-operation

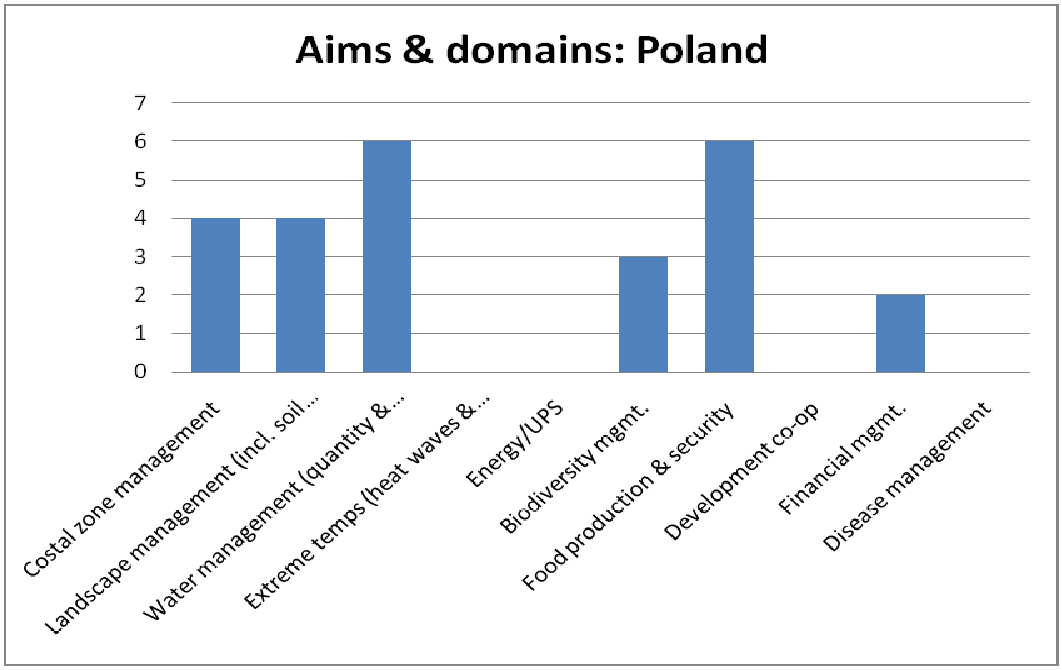

Figure I.1 Chart highlighting number of adaptation actions that cover specific adaptation aims.

Questions:

C.1 Would you say this is an accurate assessment of the aims of your adaption actions?

C.2 How have these aims been identified? E.g.

- *Domestic risk assessment studies and scenarios.*
- *Non-domestic or international risk assessment studies and scenarios.*
- *Other.*
- *Don't know.*

C.3 Who were the responsible entities for conceiving your adaptation actions and identifying these aims?

C.4 Of the 10 overall adaptation aims listed below and in the chart above, why have you decided not to cover the remaining categories?

C.5 Of the aims you do cover, how would you prioritize them in terms of importance?

C.6 Of the aims you do cover, do you feel there needs to be more research and policy action devoted to them?

Constraints to Adaptation

C.7 How would you characterize some of the main constraints to undertaking adaptation actions in your country? E.g.

- *Knowledge and research.*
- *Financial.*
- *Institutional capacity.*
- *Lack of networks.*
- *Actions of neighboring countries.*
- *EU Legislation.*
- *Role of Climate Convention.*

Appendix II. Adaptation actions identified in Phase 2 of the project (by country)

Czech Republic

Policy concerns	**Policy recommendations**	**Policy measures**
Increased risk of flooding: Increased outflow in the colder season can lead to a greater frequency of floods in the winter. Heavier rains in connection with summer storms will constitute a greater risk of flash floods.	Reduction in water consumption	*Reduction of water losses:* Reduction of water losses through repair to and reconstruction of pipeline systems
Smaller reservoirs: Climate change will vary substantially affect the size of storage space in the reservoir that would be necessary to preserve the existing level of water withdrawals.	More effective use of withdrawn water	Trading in water and its transfers
Shift in water biotope: Through a shift of sediments from higher areas, fish are washed downstream and partly destroyed by the volume of particles borne in the water.	Revision water structures	
Undesirable substances in waters: Run-off from the watershed brings a number of undesirable substances into the system – inorganic and organic pollutants, nutrients, insoluble substances, etc. This will have negative effects on the fish stock	Using free capacities	

Czech Republic (continued)

Policy concerns	**Policy recommendations**	**Policy measures**
Warming of the water: This will lead to a reduction in the numbers of species, oxygen deficit, excessive multiplication of phytoplankton and accelerated metabolism	Land-use measures	
Warming of the water: The expected increase in temperatures should create sufficient temperature security for growing semi-early varieties of corn for grain, early varieties of grapes	Subsidize protective agro-measures	
Insects and fungus: Favourable conditions for insect populations can increase the occurrence of bark insects, especially spruce bark beetles. Also, occurrence of honey fungus can grow.	Increase variety of landscape and crops	
	Minimize loss soil moisture	
	Reduce risk of erosion	
	Micro-irrigation	
	Combat pests and diseases	
	Diversify forest composition	
	Improve awareness amongst minor forest owners	

Estonia

Policy concerns	Policy recommendations	Policy measures
Increase herbage yield The soil and climate conditions for herbage are the most favourable in central and western parts of the country. A temperature rise would increase the timothy-clover mixture yield by 10% in average.		*Isolating radioactive leaking danger from storms and sea-level rise* A site at risk in north-eastern Estonia was Sillamäe, an important industrial centre. Dumping site of the former uranium enrichment plant and separated from the sea by a narrow dam, thousands of tons of radioactive substances leaked into the soil and sea every year. Sea level rise and stronger storms would have increased the risk of dam rupture, causing catastrophic pollution of the sea. The dumping site is put into sarcophagi, and is firmly isolated from the surrounding environment today.
Potato plants In general, high temperatures during the planting and sprouting period give a positive effect on potato yield. On moist soils, heavy rain falls in spring cause a very strong decrease in potato yield. However, precipitation during and after flowering gives a positive result		
Decreased cereals yield Temperature rise would decrease the cereals crop yields everywhere in Estonia. Most vulnerable would be the cultivated areas on dry sandy soils.		

Estonia (continued)

Policy concerns	Policy recommendations	Policy measures
Drought stress in forests As a result from a decrease is snow pack duration and earlier snow melt, soils would become slightly drier during the growing season and, coupled with decreased spring and summer precipitation, increase drought stress on forest grounds		
Increase fire potential Climate change could increase the forest fire potential, which could, in turn, accelerate species migration		
Increase in harvestable timber Increased nutrient availability, in particular that of nitrogen, clearly favours increased forest biomass. We assume a proportional increase in harvestable timber.		
Reduced costs of groundwater extraction Groundwater is expected to rise. Required groundwater can be obtained with fewer wells or reduced pumping. Consequently, climate change would reduce the cost of groundwater extraction from upper confined aquifers.		
Positive effect ecological water-bodies Climate warming would also have a positive influence on the ecological state of water-bodies in Estonia.		

Estonia (continued)

Policy concerns	Policy recommendations	Policy measures
Vulnerability Lake Võrtsjärv The lake has very strong ecological impact on the surrounding ecosystems. It has also been economically valuable water body for inland fisheries. According to the future climate change scenarios the warmer and wetter weather conditions could bring about higher water levels in winter in Lake Võrtsjärv, causing reduced phytoplankton biomass and in the deeper waters a reduced amount of phosphorus release from the bottom sediments, and also increased nitrogen concentration.		
Reduced species richness as a result of sea level rise Sea-level rise would reduce species richness, because the new sites for developing seashore grasslands are currently arable lands or young species-poor forests, and many of the rare species may not survive the migration into initially unfavourable conditions.		
Loss of rare ecosystems near the coastline On Hiiumaa Island, the estimate is that 100% of the reed beds and 80% of salt, and numerous lagoons are in direct danger of disappearing		

Estonia (continued)

Policy concerns	Policy recommendations	Policy measures
Beach erosion Extensive erosion and retreat of depositional coasts, e.g., sandy beaches, has been observed in Estonia in recent years. Because there is little evidence of a rising sea over this period, beach erosion appears to be largely due to the recent increased storminess in the eastern Baltic Sea. Only a slightly higher wind speed during a storm can produce a significantly higher storm surge		
Coastal damage as a result of sea ice melting Research carried out in Estonia over the last decade shows that the absence of sea ice cover in winter fosters coastal damage.		
Increased flood risk Although Tallinn's coastline is protected by dykes, the damage potential is great. Territories most vulnerable to sea level rise lie in the north. Waves during recent storms approached dwellings 300 m inland. But also natural and recreational areas are at risk.		

Hungary

Policy concerns	Policy recommendations	Policy measures
Different patterns of precipitation: It is problematic that the decreased amount of precipitations falls in a more intensive pattern which decreases the potential utilization of the water and increases the run-off, which is increasing to the risk of floods	*National Climate Change Strategy and National Drought Strategy* One recommendation of the VAHAVA research team is that this strategy should be developed and harmonised with international commitments, integrated into existing development plans and concepts, and form priorities, define the role and responsibility of the Government in execution, evaluation and monitoring of progress	
Water balance: The water stock is likely to decrease. This will influence the water balance for agriculture and can increase the water stress frequency for certain plant species		
Less surface water: Due to increased evaporation the surface area of several smaller lakes will significantly decrease. This will decrease the extent of wetland habitats and result in the loss of natural values of the country		
Salinization and eutrophication of water		
Increase of drought		

Latvia

Policy concerns	Policy recommendations	Policy measures
Increased risk of flooding One of the most dangerous consequences of climate change is the increase in sea-level rise combined with more frequent and intense storms. Due to that, the overflow of low coastal territories and wash-off of the coast, dunes, populated territories, buildings, roads and forest and agricultural areas occur	*Dumping of ground in shallow water zones* As a result of declining coastal ice, erosion of the coast increases. Low sandy coasts with dunes are most vulnerable. Dumping of ground regularly removed from port aquatoria and ship waterways in these shallow water zone is one of the essential measures	*Law on Protected Belts* This law defines the principles for establishing a protective zone along the coast of the Baltic Sea, to preserve forests for their protective function, avert the development of coast erosion processes, ensure protection and preservation of coastal ecosystems
	Preservation of existing biodiversity and quality of forests Protecting the climate and water regime, protecting the soil, afforesting non-agricultural lands (thereby also increasing CO2 removals) are measures to preserve the existing stable quality of forests in Latvia. This way, the adverse economic effects on the development of the country resulting from destabilizing biotopes (as a result of the invasion of new species) can be combated.	

Actions reported by Latvia

1. **Latvian report on adaptation to climate change** (CC) predicts two (inter-ministerial and expert) working groups establishment, was accepted in Cabinet of Ministers in the 5 August, 2008. The main task of these groups are to work out system, mainstream development, tasks for additional researches and prioritised policy measures and tools and **until the end of 2009 elaborate conception with concrete scenarios for adaptation.** Then our government with acceptance of this conception will decide which body of policies we should realize (which scenario would be the most appropriate).

2. National Research Programme KALME "Climate change impact on the waters of Latvia" (2006-2009): general goal of this programme is to assess short-, medium-, and long-term impact of climate change on the environment and ecosystems of inner waters of Latvia and the Baltic Sea, and to create a scientific basis for adaptation of environmental and sectoral policies of Latvia to CC.

3. Latvian Sustainable Development Strategy up to 2030 (under preparation) - after accepting into Cabinet of Ministers Strategy will come by law; a great part in it will be devoted to the climate change issue and adaptation to it (as to risk source and barrier for welfare and sustainable development).

4. National Development Plan for 2007 – 2013 (2006) - one of the tasks is to facilitate evaluation, mitigation and monitoring of the risks to nature, including climate change and industrial risks.

5. National Security Conception (2008) is elaborated on the basis of the Analysis of Danger to the State, which determines the basic strategic principles, priorities and measures for the prevention of danger (including climate change risks) to the State. National security conception besides other threats (e.g. military) predicts response to react to environmental risks, including those caused by climate change, and asks for appropriate policy and tools` elaboration.

6. Civil Protection Plan (2007), Civil protection Law (2006), Law on State Material Reserves (2007).

7. National Flood Risk Assessment and Management Programme for 2008-2015 (2007) - defines criteria for flood risk assessment, identified floods risks in all Latvia's territory, analysis historical and financial consequences of damages made by floods, prioritized risk territories for further researches and measurement taking.

8. National Lisbon programme for 2005-2008 included necessity of climate change impacts` evaluation, necessity to decrease these risks and their impacts to economics and social area, and to adapt to climate change.

Adaptation to climate change is involved also in several **sectoral** policy planning documents and legal acts:

9. Conception on Risk Management Policy in Agriculture (2007) and its Regulations of Cabinet of Ministers foreseen administration and supervision of agricultural risk fund.

10. Latvian Rural Development National Strategy Plan for 2007-2013 (2006) predicts risk management, including risks caused by climate change (flooding, draught and killing frost).

11. Law on Latvia's participation in the Kyoto protocol flexible mechanisms (2007) - Regarding Article 17 of Kyoto Protocol, Latvia has decided to participate in flexible mechanisms (e.g. International emission trading or IET). It gave possibility for earmarking 40 million of Assigned Amount Units (AAUs) (emissions in Latvia are 59% under estimated level) to be potentially available for Latvia during first (2008-2012) commitment period. This law predicts development of Climate change financial instrument what means that every AAU sold will be used for "greening" purposes, including adaptation policy and measures.

12. National programme for EU financing planning period 2007-2013 in measure "Environment" in activity "Reduction of Environmental Risks"- flood risk management, including reconstruction of hydrotechnical buildings, etc.

13. National programme for EU financing planning period 2007-2013 in measure "Support for Sustainable Urban Environment and Urban Area Development".

14. National programme for EU financing planning period 2007-2013 in priority „Promotion of Environmental Infrastructure And Environmentally Friendly Energy".

15. Forest and related to Forest Branches Development Programme (2006)

16. Law On Protected Belts (1997).

17. Individual nature protection and use rules for particular protected territories (for example, for flood-grasslands, Coastal Nature Park, other types of coastal zones).

18. Law on territory planning (2002)

19. Spatial Planning Law (2002) – foreseen the prevention of environmental risks.

20. State Forest Monitoring Programme – the main task is to explore the impact of climate changes to forest ecosystems, forest biodiversity status and changes as well as to forest soils.

21. National Programme for Environmental Monitoring for 2009-2012

Lithuania

Policy concerns	Policy recommendations	Policy measures
Change in wintering conditions of biennial and perennial plants Shorter in duration and irregular snow cover, crop saturation and suffocation caused by frequent thaws, early vegetation of winter corps, fruit shrubs and fruit trees exposed to a high probability of frosts (which can make harm) is altering the wintering conditions of biennial and perennial agricultural crops	*Irrigation and drainage systems* Fluctuations and irregular humidity cause droughts. Therefore, effective irrigation and drainage systems would be necessary to mitigate adverse effects	*Management programmes to stop the beach degradation process in Palanga Resort Municipality*
Precipitation and storms will damage agricultural crops Increase in precipitation in the form of strong storms, which intensifies soil weathering, increase haymaking and the harvest costs, impair crop quality and causes loss of some part of crop		
Rapid temperature rise can lower agricultural productivity because the period of flowering and ripening becomes shorter and grains fail to grow in full		
Increased air temperature and CO2 concentrations results in higher agricultural productivity		
New pests and diseases Due to a warmer climate, local pests will spread and new pests and diseases will arrive and this will negatively affect agriculture and increase investment costs		

Lithuania (continued)

Policy concerns	Policy recommendations	Policy measures
Increasing dryness in summer Due to a decrease in precipitation and increase in temperature, increasing dryness would be particularly unfavourable for late grain crops, root vegetables, and pasture's vegetation		
Drying out and degradation of spruce forests Mass drying out and degradation of spruce forests caused by spread of secondary pests is the beginning of great forestry problems expected in Lithuania. This will cause economic losses in forestry		
Halt in migrating return of valuable fish Warming of inland water can halt the migrating return of valuable fish from sea waters to inland waters. This will cause economic losses in fishery		
Hunting resources Acting upon animals, climate change affects economy through losses in hunting resources *Biodiversity changes due to warmer temperatures* Global warming results in an arrival of new species, but also in a northward shift of ecosystems and inhabitant species. This will result in loss of valued or protected areas. International cooperation is needed for transboundary protection and for creating new common systems or networks of protected territories		

Lithuania (continued)

Policy concerns	Policy recommendations	Policy measures
Wind erosion Since 1991, reduction in the area of arable lands and belated sowing reduced a probability of wind erosion under deflation-favourable meteorological conditions, More research is needed in this area		
Reduced winter tourism A decrease in snow cover in the recent decade considerably reduces winter tourism		
Longer summer tourism season Summer season is becoming noticeably longer in holiday resorts near the Baltic Sea		
Reduced fuel need The period of heating in cities, towns and settlements is becoming considerably shorter, which allows saving fuel New diseases and a spread of pollen pose a threat to human health		
Rapid spread of bloodsucking insects		

Actions reported by Lithuania

Lithuanian Government has included adaptation measures, according to the UNFCCC, in several national strategies:

- State Long-term Development Strategy", National Sustainable Development Strategy
- The State Environmental Monitoring Programme of 2005-2010
- Lithuanian Baltic Sea Coastal Management Strategy (2001),
- Lithuanian Forest Increase Programme 2003-2020
- Law on Environmental Protection
- State Public Health Observation Programme
- National Environmental Healthiness Action Programme (2003-2006)

Poland

Policy concerns	**Policy recommendations**	**Policy measures**
Choice of appropriate plants for agriculture	Ensure appropriate water quality	
Change in land-use and crop structure	Prevention of soil desiccation & erosion	
Progressive regionalization of agricultural production	Reduce water losses in industry and municipal economy	
Improvement of agricultural production efficiency	Enhance water storage capacity , particularly through small retention	
Substantial organizational changes in agriculture and higher capital outlays supported by external financing of agriculture	Enhance the resistance of forest ecosystems to temperature and precipitation variation	
	Integrate expected climate change into the principles of silviculture and forest management instruction	
	For coastal zones, conduct systematic measures to track climate change, on an operational basis, including the marine system observations and predictions of hydro meteorological conditions within the framework of the global observation network.	
	Conduct analytical studies on the sensitivity of the Polish coastal zone to sea level change	

Poland (continued)

Policy concerns	Policy recommendations	Policy measures
	Implement the strategy for the protection of the Polish coast against the effects of sea level change e.g. through the integrated management of coastal zones in the Baltic states	
	Increase capital outlays supported by external financing for coastal zone management	
	Introduction of technologies rationally using water resources and the longer vegetation season	
	Creation of water infrastructure, water reservoirs and intakes	

Slovakia

Policy concerns	Policy recommendations	Policy measures
Vulnerability of high mountain forests Because the inhabitant spruce community will be bothered by a precipitation deficit, high mountain forests will be vulnerable to windstorms and intensive rains. Also, warmer winters will make them more accessible for insects	*Changes in crop growing technologies* It is emphasized to apply an approach of sustainable management, without extremes and natural recovery of soil fertility in agriculture, to mitigate negative impacts and utilize positives ones. Focus should be on growing fruit and vegetables. Application of herbicides on weeds should be limited.	
Vulnerability of middle mountain forests Middle and mountain levels will be impacted by snow and hoarfrost	*Changes in cultivation programmes* Efforts should be given to cultivation of hybrids that are adaptable to biotic and a-biotic stresses. Special attention should be paid to the division of seeds	
Forests in uplands will be impacted trough drought	*Changes in crop protection* The focus should be on biological protection and application of integrated protection	
Bank coverage and lowland forests will be exposed to floods	*New approaches in plant nutrition* The most important positive effect may be obtained by an application of organic manure in combination with industrial fertilizers. Particularly nitrogen nutrition leads to a decrease in humus in the soil	

Slovakia (continued)

Policy concerns	Policy recommendations	Policy measures
Increasing air temperature and decreasing total precipitation in the warm period could lead to a decrease of relative air humidity. This will result in less favourable conditions for high forest and the expansion of xerotherm shrub vegetation and steppe vegetation forms	*Reduce the risk of water and wind erosion on agricultural lands* By increasing the share of fodder crop in arable land, grassing of shallow soil, upgrading of protective forest belts, adjusting of structure and compactness of the soil	
Positive impacts on agriculture The extension of the large vegetation period will increase the agricultural production potential	*Raise public awareness* Seminars, conferences and public media are effective means to increase public awareness and dissemination of information on climate change. This should be connected with education	
	Strengthen water monitoring system It is necessary to strengthen the existing monitoring system of water quality and water quantity in basins, including smaller ones, in order to improve the identification of water reduction strategies	
	Compensate for the decline in water reduction yield It is necessary to take into account the possibility to compensate for the decline in water resources yield, especially in the lowlands of Central and East Slovakia	

Slovakia (continued)

Policy concerns	Policy recommendations	Policy measures
	Retention reservoirs to regulate runoff It is necessary to assess the possibility of the construction of retention reservoirs that would allow for the regulation of runoff	
	Better water resources legislation Current water policy and landscape and urban planning policies do not take into account the need to adaptation measures	
	Change water consumer behaviour Subsidies, taxes, charges and fines should be targeted at better water consuming behaviour.	
	Technical measures for the water demand side Trough technical means, a reduction of specific water consumption per capita, a reduction of losses in the production and distribution of drinking water, rain harvesting, construction of divided water supply systems in small residential areas, should be established	

Slovenia

Policy concerns	Policy recommendations	Policy measures
Fertilising effect of increased CO2 concentrations With an optimal supply of nutrients, water and plant protection, and optimal temperatures, plants increase their photosynthetic activity and their leaf surface. Another important direct impact of higher CO2 concentrations is the partial closure of stomata (pores) which reduces transpiration, both effects decreasing the need for water.	*Adaptation measures for agriculture* Measures include: changing sowing dates; changing varieties used (exchanging later crops with earlier); more intense fertilisation to compensate for the reduced growing time and water shortage; changes in sowing structure, farm production policy and production technology; changes to crop rotation; improving soil state during droughts by increasing humus/topsoil; construction of irrigation systems to combat negative environmental impact, guided irrigation using irrigation models and taking into account meteorological conditions and weather forecasts to optimise water use, and finally protecting agricultural land from extreme conditions (storms, spring frost, droughts, floods).	
Longer vegetation period and better temperatures for heat loving plants	*Informing the public* The future adaptation to variability and climate change depends largely on informing the public. Users must be provided with information from current monitoring systems in a more efficient manner.	

Slovenia (continued)

Policy concerns	Policy recommendations	Policy measures
Negative impacts on livestock Climate change will have direct and indirect negative impacts on livestock, primarily through changes to pastures and grazing, and the health and nutrition of livestock. These are more frequent summer droughts, changed composition of pasture, more energy to ventilate and cool barns in summer, lack of drinking water, reduced appetite, fodder harder to digest, fodder production riskier, and fodder more expensive	*Adaptation measures for forests* The measures include provisions to preserve forest vegetation, preventing progressive forest succession onto abandoned agricultural land, and directing artificial restocking of forests from conifers to deciduous trees, which will demand the development of new technologies to grow deciduous saplings. A methodology must be prepared immediately to categorise forest composition and their growing sites according to sensitivity to the forecast climate changes, and produce a cartographic record of forest composition and growing sites with respect to that sensitivity.	
Positive impacts on livestock Extending grazing period expansion of grazing to higher altitudes, extending grazing period expansion of grazing to higher altitudes, cold stress less frequent, less energy needed to heat barns in winter, and increased production of heat loving crops	*Fire prevention in forests* The increased threat of forest fire demands the planning, set up and maintenance of appropriate fire prevention breaks, particularly in forest areas where conifers predominate.	
Increased risk of forest fires	*Changes in location of agricultural production*	
Forest biodiversity is threatened It is the biodiversity of Slovenia's forest that is most threatened by climate change. Species in the periphery of the high Alpine habitats will be threatened, as well as species who require cold weather to grow		

Slovenia (continued)

Policy concerns	Policy recommendations	Policy measures
Increased competition between sectors for water The trend towards a reduction on available water will increase competition between sectors for access to water resources.		
Outdoor activities will be affected by increasing extreme events and this will result in economic damage Outdoor activities are most susceptible to extreme phenomena, e.g. agriculture, tourism, transport, though many other sectors will also be affected. Increased economic damage is also therefore to be expected.		